

Ten New Species of *Impatiens* (Balsaminaceae) from Thailand

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Abstract

Ten new species of *Impatiens* (Balsaminaceae), *I. adenioides* Suksathan & Keerat., *I. charisma* Suksathan & Keerat., *I. daraneenae* Suksathan & Triboun, *I. doitungensis* Triboun & Sonsupab, *I. jiewhoei* Triboun & Suksathan, *I. oreophila* Triboun & Suksathan, *I. ruthiae* Suksathan & Triboun, *I. sirindhorniae* Triboun & Suksathan, *I. spectabilis* Triboun & Suksathan, and *I. tigrina* Suksathan & Triboun from Thailand are described and illustrated.

Introduction

The genus *Impatiens* consists of over 1,000 species of annual or perennial herbs widely distributed in tropical and sub-tropical regions of Africa and Asia. A few members of the genus extend into Europe, and Central and North America (Fischer, 2004). In contributions to the Flora of Southeast Asia II, Shimizu (1970) recognized 39 plus 3 doubtful species as native to Thailand. Subsequently many new species were discovered, and were added into the account (Shimizu, 1977, 1991, 2000; Shimizu and Suksathan, 2004) raising the total number of native Thai species to approximately 50. In connection with a revision of the family Balsaminaceae for the Flora of Thailand, intensive collecting in recent years in poorly explored mountain areas as well as material studied in herbaria worldwide have revealed several more undescribed species. Therefore, our assessment of the species diversity in the country may be underestimated, and more species probably await discovery.

In this paper we describes 10 new species using the descriptive terminology of Grey-Wilson (1980), except for the terms *upper pair* and *lower pair* of lateral sepals for which we prefer to use *inner pair* and *outer pair* respectively. *Impatiens sirindhorniae* is, by gracious permission, dedicated to Her Royal Highness Princess Maha Chakri Sirindhorn, in appreciation of her enormous contributions to the conservation of indigenous Thai wildlife.

The new species

1. *Impatiens adenioides* Suksathan & Keerat., *sp. nov.*

Impatiens mirabilis Hook.f. *affinis*, a qua differt lamina minori elliptica ad oblanceolata coriacea, margine acute serrata, bracteis florium eglandulatis –

Typus: S Thailand, cultivated in Bangkok, originally from limestone area in Phatthalung Province, 15 Apr 2009, K. Keeratikiat & C. Punpreuk 146 (holo, QBG; iso, BK, SING). **Fig. 1 & Plate 1A.**

Lithophytic, succulent perennial **herbs**, up to 100 cm tall, with swollen caudiform base, up to 30 cm in diameter, wholly glabrous; **stems** 4-7(-14) upright, 2-3 cm in diameter at the base, moderately branched in upper part. **Leaves** spirally arranged, crowded on the upper part of stem, petiole *ca* 1 cm long; lamina elliptic to oblanceolate, 6-8 × 3-4 cm, coriaceous, apex acuminate, base cuneate, margin acutely serrate, with two glands in the lower half; *lateral veins* 7-10(-12) pairs. **Inflorescence** a stout 6-10(-20)-flowered terminal to subterminal raceme, simple or 2-3(-6) branched, up to 15 cm long, waxy green; the branch subtended by a small lanceolate, biglandular, ± caducous bract, *ca* 5 mm long. **Flowers** waxy yellow, 3-3.4 cm long, pedicels rather thick, *ca* 0.5 cm long, subtended by a green, ovate, mucronate, caducous bract, *ca* 4 mm long; lateral sepals 4, the outer pair rather thick, *ca* 7 × 5.5 mm, ovate, shortly mucronate, the inner pair *ca* 4 mm long, linear-lanceolate, acute, lower sepal *ca* 13 mm long, *ca* 9 mm deep, deeply navicular, entirely yellow, abruptly constricted into a 1 cm-long, slender straight spur, incurved only at the tip; dorsal petal *ca* 10 × 9 mm, suborbicular, shallowly cucullate, with a green crest which is broadest in the middle, apex slightly emarginate; *lateral* united petals connate, entirely yellow; upper petals *ca* 7 × 10 mm, semicircular, apex round; lower petals connate for about half the length, obovate in outline, *ca* 12 × 10 mm, apex deeply bilobed, the lobe apically shallowly emarginated. Ovary glabrous. **Fruit** *ca* 2 cm long, clavate; **seed** unknown.

Additional specimen examined: Thailand, Chumphon Prov., R. Pooma, V. Cheamchumroon & P. Chantaboon 3514 (BKF).

Distribution and habitat: Endemic to peninsular Thailand (Chumphon, Phatthalung). Scattered in lowland, shaded, rugged limestone hills.

Etymology: The specific epithet, *adenioides* refers to its growth habit, which resembles that of *Adenium* (Apocynaceae).

Notes: *Impatiens adenioides* was introduced to the first author by Kaweesak Keeratikiat and Chuyos Punpreuk, plant lovers from Bangkok who

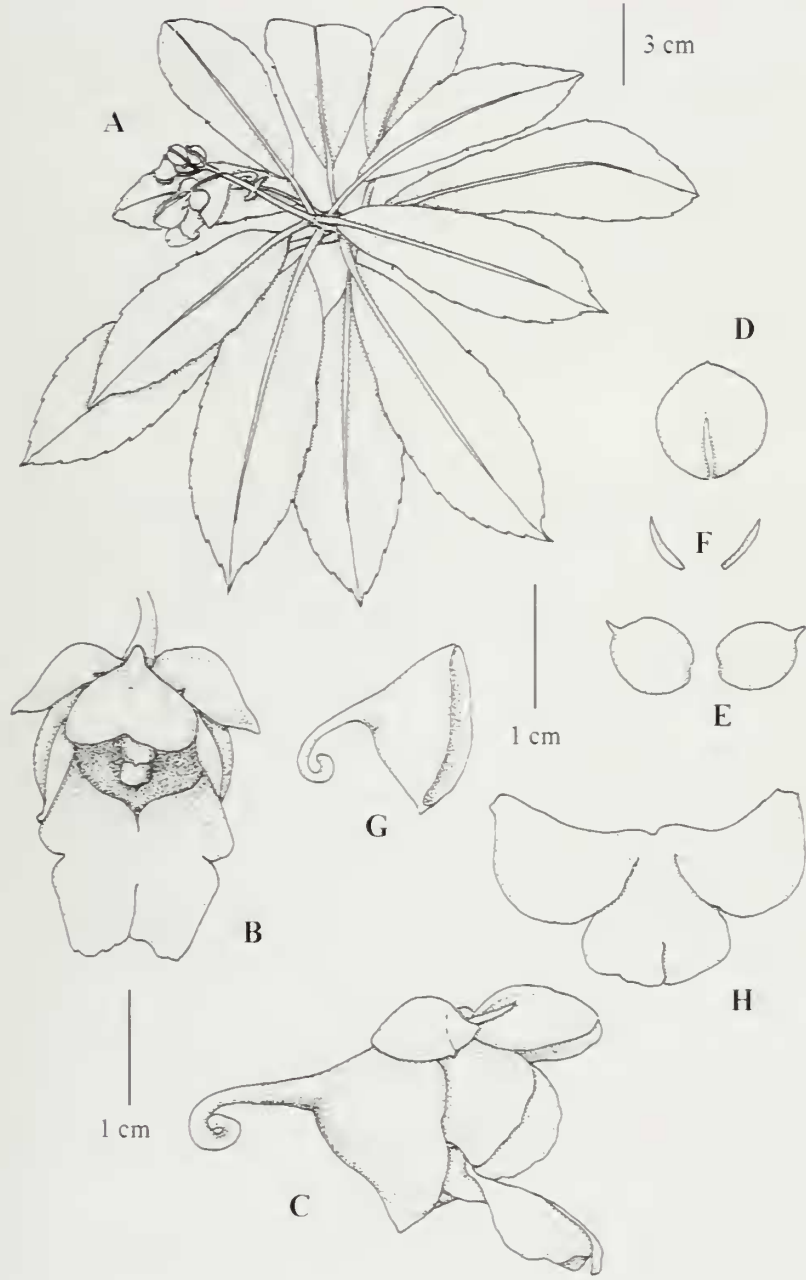


Figure 1. *Impatiens adenioides* Suksathan & Keerat. A. Habit; B, C. Flower; D. Dorsal sepal; E. Outer lateral sepals; F. Inner lateral sepals; G. Lower sepal; H. Lateral united petals. (B-C and D-H share the same scale bar). [Drawn by P. Suksathan.]

received the plant from local people in Phatthalung province. Among the other caudex species found in peninsular Thailand, i.e., *I. mirabilis* Hook. f., and *I. opinata* Craib, *I. adenioides* is easily recognized by its elliptic to oblanceolate, thick-leathery lamina, with acutely serrated margin, and also its eglandular flower bracts.

2. *Impatiens charisma* Suksathan & Keerat., *sp. nov.*

I. phengklaui Shimizu & Suksathan *affinis*, a qua differt cauli alata, petiolis et pedunculis planis, flore petalis cum pari superiori lateralibus connatis et per pares petalorum inferiorum superpositis. – **Typus:** W Thailand, Kanchanaburi Province, Sai Yok district, 750 m alt, 5 Aug 2008, P. Suksathan, P. Triboun, H. Boonnuang & K. Keeratikiat 4679 (holo, QBG; iso, BK, SING). **Fig. 2 & Plate 1B.**

Tuberous rooted perennial **herbs**, completely glabrous, tuber up to 15 cm in diameter; **stems** annual, 1-2, erect, unbranched, arising from points at the top of the tuber, to 20 cm long, 4-6 angled, distinctly winged along stem angles. **Leaves** spirally arranged, petiole 3-8 cm long, slightly flat, winged; lamina up to 21 × 10 cm, elliptic, apex acuminate, base cuneate to rounded, sometimes oblique, tapering into narrow wings along petiole and stem, margin shallowly crenate, with two fusiform glands just above the base; lateral veins 7-10 pairs. **Inflorescence** (1-) 2-flowered subumbellate raceme, borne in the upper leaf axils; peduncles up to 10 cm long, flat, terminating in 3-4, light green, narrowly elliptic to lanceolate, persistent bracts. **Flowers** yellow, 4.5-5 cm long, with red tint at spur base; pedicels *ca* 2.5 cm long, slender; lateral sepals 4, the outer pair greenish white, *ca* 1.6 × 1.3 cm long, obliquely ovate, mucronate, the inner pair strongly reduced into yellow, *ca* 3 mm long, obliquely ovate scales; lower sepal *ca* 3 cm long, *ca* 3.5 cm deep, bucciniform, abruptly constricted into a narrow, *ca* 1.5 cm long incurved spur, the tip of spur minutely bifid; dorsal petal *ca* 2.3 × 2 cm, slightly cucullate, broadly obovate to suborbicular, strongly reflexed in the upper half, apex obcordate, with sub-apical mucro; lateral united petals connate; upper petals *ca* 1.6 × 1.3 cm, broadly ovate, short-apiculate at apex; lower petals *ca* 2.7 × 2.4 cm, obovate, shortly apiculate at apex. Ovary glabrous. **Fruit** ellipsoid; **seeds** unknown.

Flowering during the rainy season, between August and October.

Distribution and habitat: Endemic to W Thailand (Kanchanaburi). Growing in shaded limestone crevices along cliffs in mixed bamboo forest, *ca* 750 m alt., rather rare.

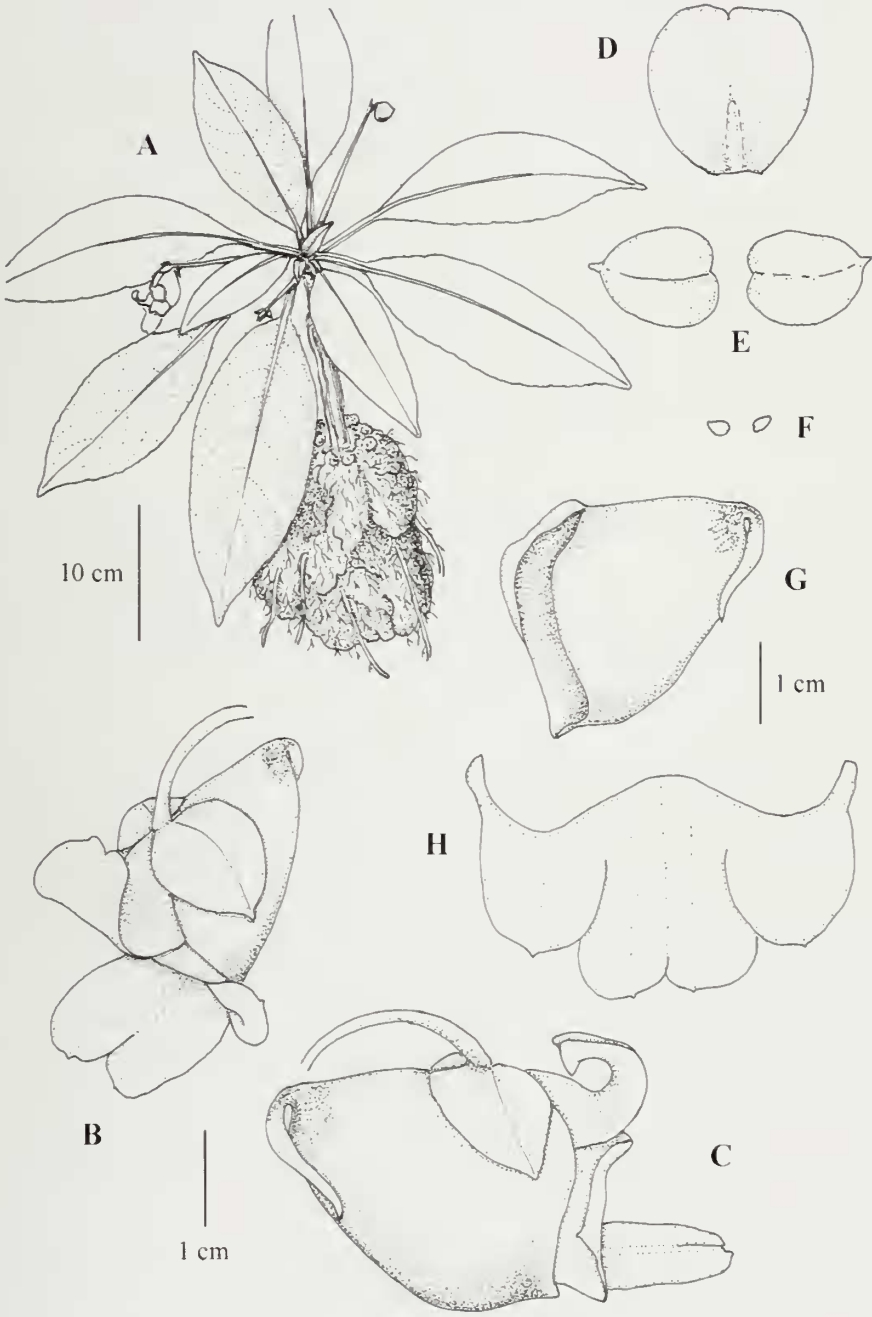


Figure 2. *Impatiens charisma* Suksathan & Keerat. A. Habit; B. C. Flower; D. Dorsal sepal; E. Outer lateral sepals; F. Inner lateral sepals; G. Lower sepal; H. Lateral united petals. (B-C and D-H share the same scale bar). [Drawn by P. Suksathan.]

Entymology: The specific epithet, *charisma* - respect and loyalty earned by the performance of good deeds, is dedicated to our beloved king, His Majesty King Bhumibol Adulyadej, Rama IX of Thailand, who has been a tireless advocate for the nature and environment proposing guidelines on the principles of sustainable conservation and the development of natural resources.

Notes: This rare elegant balsam is one of the only two representative of tuberous species found in SE Asia (the other is *Impatiens phengklaii* Shimizu & Suksathan). In both species, the annual stems die back to the tuberous caudex at the end of the growing season (May-November). *Impatiens charisma* is easily distinguished from *I. phengklaii* by having winged stems, flat petioles and peduncles, and the broader upper pair of lateral united petals that at the base overlap to the lower one.

3. *Impatiens daraneenae* Suksathan & Triboun, *sp. nov.*

Impatiens hongsonensis Shimizu *affinis*, a qua differt floribus distortis roseis, sepalo infero angustiore bucciniformi, petalo inferiori connato oblongo. –

Typus: N Thailand, Chiang Mai Province, Chiang Dao district, limestone outcrops along roadside to Mueang Kong, ca 850 m alt., 7 Oct 2008, P. Suksathan & M. Wongnak 4672 (holo, QBG; iso, AAU, BK, BKF, SING).

Fig. 3 & Plate 1C.

Annual **herbs**, wholly glabrous; **stem** decumbent to erect, dark purplish brown, rather thin, up to 50 cm long, laxly branched, slightly zigzag in upper part. **Leaves** alternate, petiole up to 3.6 cm long; lamina up to 6.7 × 3.9 cm, ovate, apex acuminate, base cuneate to rounded, sometimes oblique, margin crenate-dentate, with two distinct, short-stalked glands at the base; lateral veins 6-7 pairs. **Flower** axillary, solitary or 2-3-fascicled, pendulous under the leaves, distorted, light pink, 4.0-4.2 cm long; pedicels ca 1.3 cm long, minutely bracteate at base; lateral sepals 4, the outer pair whitish green, ca 5 × 5 mm, obliquely broadly ovate, mucronate, the inner pair strongly reduced into purple, subelliptic scales, ca 2 mm long; lower sepal 1.5 cm long, 2.5 cm deep, broadly bucciniform, pinkish white, with pink reticulate veins, clearly visible on the inner surface, abruptly constricted into a narrow, ca 8 mm long incurved cylindrical spur, the tip of the spur minutely bifid; dorsal petal ca 1.1 × 0.8 cm, obovate, strongly reflexed in the upper half, minutely mucronate, base with a short, green, conical crest; lateral united petals connate, pink, with two yellow patches at the base of lower petals, unequally distorted; upper petals 7-13 × 8-10 mm, obliquely ovate; lower petals connate about two-third of the length, distorted oblong in outline, ca 20 × 12 mm, apex deeply bilobed, the lobe apically emarginated. Ovary glabrous. **Fruit** ellipsoid; **seeds** unknown.

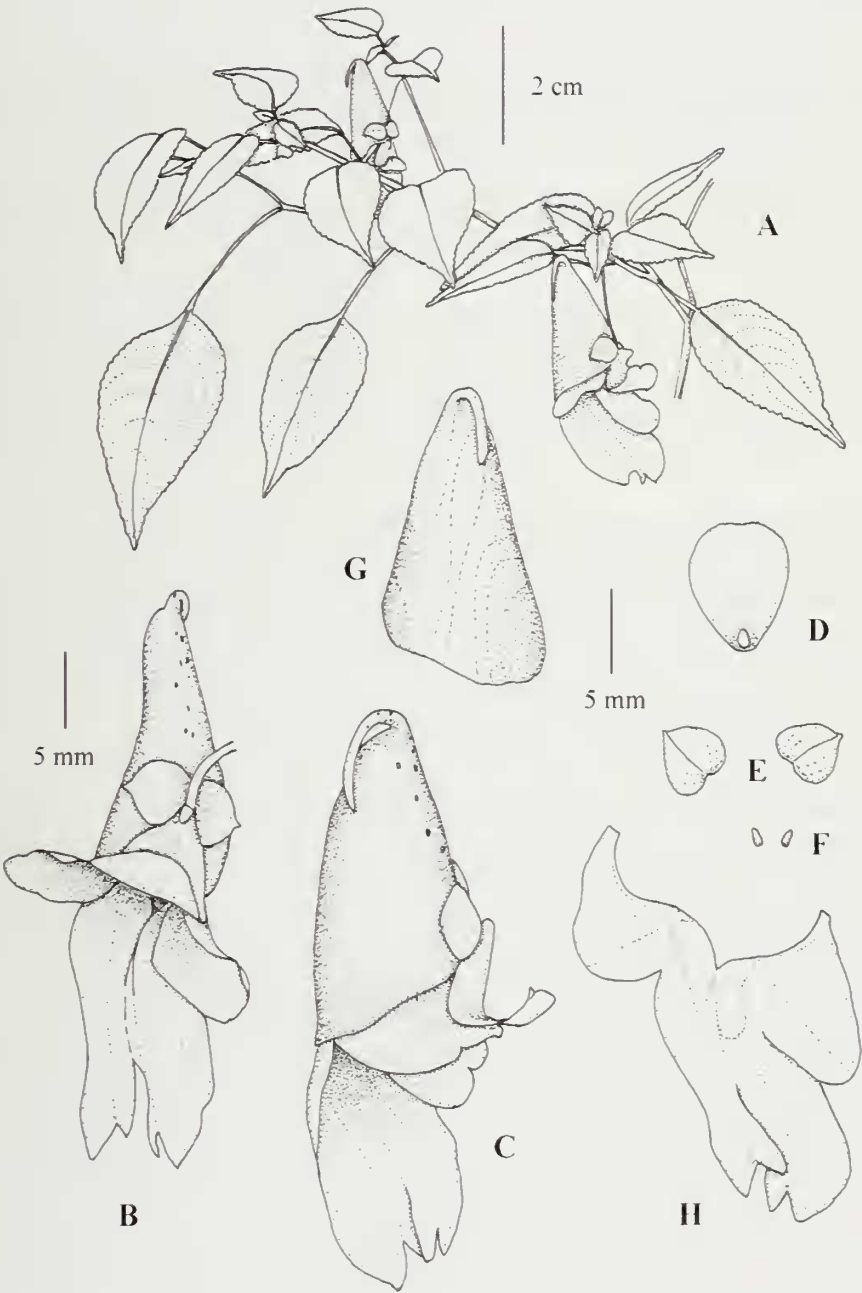


Figure 3. *Impatiens daraneenae* Suksathan & Triboun. A. Habit; B, C. Flower; D. Dorsal sepal; E. Outer lateral sepals; F. Inner lateral sepals; G. Lower sepal; H. Lateral united petals. (B-C and D-H share the same scale bar). [Drawn by P. Suksathan.]

Flowering during the rainy season, August-October.

Distribution and habitat: Endemic to NThailand (Chiang Mai). Growing on limestone outcrop in mixed bamboo forest, *ca* 850 m alt. Locally common, but as yet known only from the type locality.

Etymology: The plant is named in honour of Mrs. Daranee Derojanawong, a plant lover from Bangkok who kindly helped us finding research funding.

Notes: *Impatiens daraneenae* was firstly discovered by the second author during his field work in connection with the revision of the family Gesneriaceae for the Flora of Thailand. It is easily distinguished by its distorted, light pink flower, narrow bucciniform lower sepal, and oblong lower connate petals with two basal yellow patches.

4. *Impatiens doitungensis* Triboun & Sonsupab, *sp. nov.*

Impatiens lacinulifera Y.L.Chen *affinis*, a qua differt floribus pupureo-roseis, sepalis lateralibus laevibus, calcar apice obtusa, petalo dorsali ad basin cristato, marginis foliorum cum dentibus sinuum prominentibus. – **Typus:** Thailand, Chiang Rai Province, Mae Sai-Mae Fa Luang district, Doi Tung, limestone crevices near summit, 1,300 m alt., 26 Jul 2008, P. Triboun, P. Blenchitra & B. Sonsupab 3850 (holo, BK; iso, QBG). **Fig. 4 & Plate 1D.**

Small lithophytic annual **herb**, completely glabrous; **stems** light green, erect, slender, 10-20 cm tall, simple to laxly branched. **Leaves** alternate, crowded on the upper part of stem, petiole 7-10 mm long, light green, with many small red patches; lamina ovate to lanceolate, *ca* 5.0 × 2.5-2.9 cm, apex mucronate, base obtuse to cuneate, sometimes slightly oblique, margin serrulate with prominent sinus-teeth, the two black-tipped basal glands obtuse; lateral veins 6 pairs. **Flowers** axillary, solitary or 2-fascicled, pendulous under the leaves, purplish pink; pedicels *ca* 4 cm long, minutely bracteate at base; lateral sepals 4, the outer pair greenish white to pale pink, *ca* 7 mm long, broadly ovate, mucronate, the inner pair strongly reduced into pink small scales, *ca* 2 mm long; lower sepal *ca* 2.4 cm long, *ca* 2 cm deep, obliquely bucciniform, pale pink, with red veins, clearly visible on the inner surface, abruptly constricted into a narrow, 1.1-1.3 cm-long, white, incurved cylindrical spur; dorsal petal *ca* 1.4 × 1 cm, obovate, strongly reflexed in the upper half, apically emarginate, base with a short, green, subtriangular, pointed crest; lateral united petals connate, entirely pink except for two yellow patches at the base of lower petals; upper petals 1.1-1.2 × 0.8 cm, ovate, apiculate; lower petals *ca* 2 × 1 cm, connate about three-quarters of the length, narrowly obovate in outline, apex 2 lobed, the lobe apiculate. Ovary glabrous. **Fruit** linear, slender; **seeds** unknown.

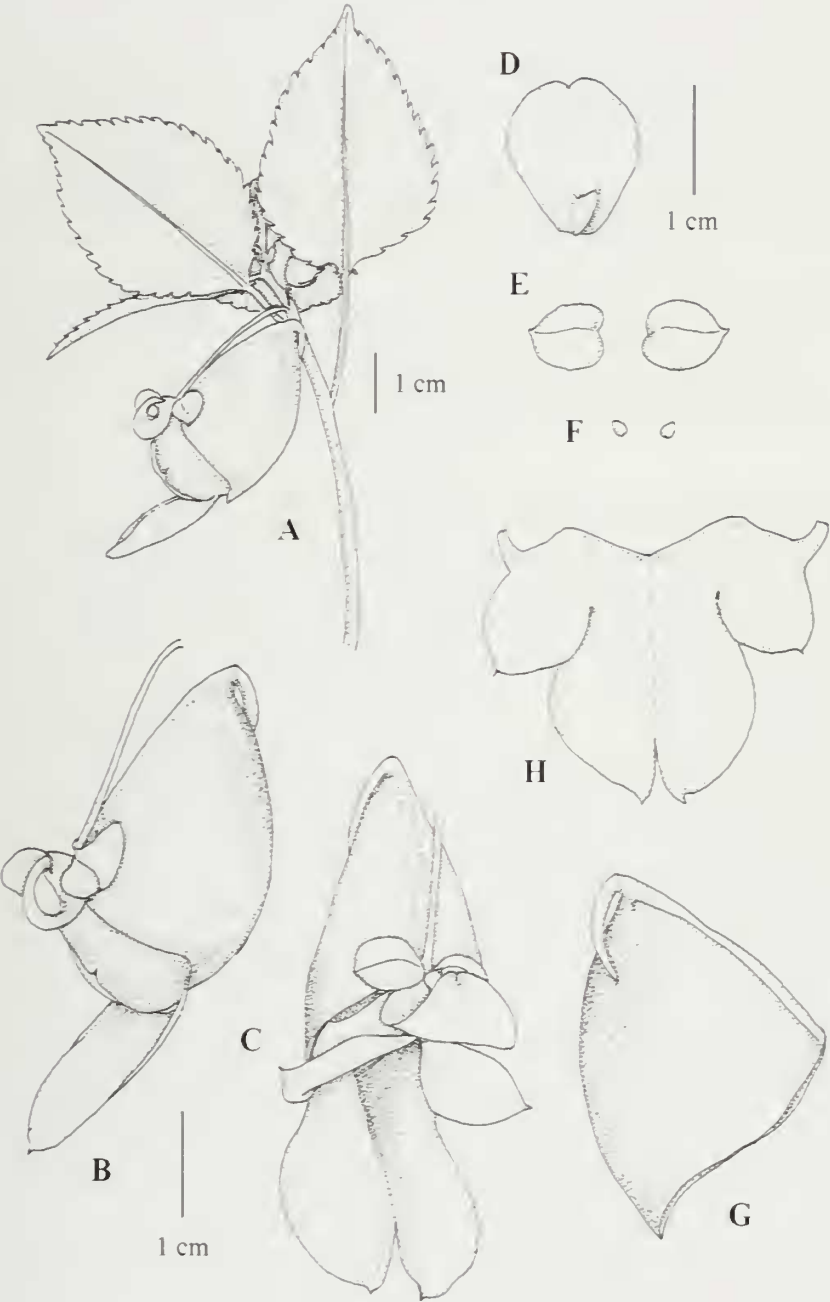


Figure 4. *Impatiens doiungensis* Triboun & Sonsupab. A. Habit; B, C. Flower; D. Dorsal sepal; E. Outer lateral sepals; F. Inner lateral sepals; G. Lower sepal; H. Lateral united petals. (B-C and D-H share the same scale bar). [Drawn by P. Suksathan.]

Flowering in rainy season, between July and August.

Distribution and habitat: Endemic to Northern Thailand (Chiang Rai). Growing in open limestone scrub vegetation, on the summit of limestone mountain *ca* 1,300 m alt. As yet known only from the type locality.

Etymology: The specific epithet is named from the type locality at Doi Tung where it was collected.

Notes: *Impatiens doitungensis* resembles the Chinese species *I. lacinulifera* Y.L.Chen but clearly differs in its purplish pink flower with smooth lateral sepals, blunt tipped spur, basally crested dorsal petal, and especially a presentation of prominent sinus-teeth along leaf margin.

5. *Impatiens jiewhoei* Triboun & Suksathan, *sp. nov.*

Impatiens nalampoonii Shimizu *affinis*, a qua differt floribus violaceo-caeruleis sepalo infero rubro-striato, calcar curvato ad basin adnato cylindrico. – **Typus:** Thailand, Kanchanaburi Province, Mueang distric, Khao Pun cave, mixed bamboo forest in shaded limestone area, 11 Oct 2008, P. Triboun, H. Boonnuang & K. Keeratikiat 3893, (holo, BK; iso, QBG, SING). **Fig. 5 & Plate 2A.**

Lithophytic annual **herb**, completely glabrous; **stem** decumbent to erect, green to reddish green, rather thin, to 70 cm long, laxly branched, slightly zigzag in upper part. **Leaves** alternate, petiole (1-)2-7.5 cm long; lamina 5-12 × 2.5-6.5 cm, ovate to lanceolate, apex acute to acuminate or blunt, base cuneate to cordate, margin serrate, with two distinct, deltoid glands near the base; lateral veins (4-)5-6 pairs. **Flowers** axillary, solitary or 2 fascicled, pendulous under the leaves, 3-3.2 cm long, violet-blue, with a narrow long, yellow patch at the base of the lower connate petal; pedicels 0.5-1.5 cm long, minutely bracteate at base; lateral sepals 4, the outer pair pale green tinged purple, *ca* 10 × 5 mm long, obliquely ovate, mucronate, the inner pair strongly reduced into narrowly lanceolate, *ca* 3.5 mm-long scales; lower sepal 1.6 cm long, 1.8 cm deep, broadly saccate, pale pink with red striped veins, clearly visible on the inner surface, abruptly constricted into a narrow, cylindric, green, incurved, 1.3 cm long spur, the spur tip dark red; dorsal petal blue, *ca* 1.9 × 1.7 cm, obcordate, slightly cuculate, strongly reflexed in the upper half, base with a short, subtriangular crest; lateral united petals connate, violet-blue, with a narrow longitudinal yellow patch in the middle of the connate lower petal; upper petals *ca* 9 × 7 mm, obovate, apex slightly bilobed; lower petals connate about two-third of the length, broadly ovate in outline, *ca* 2.3

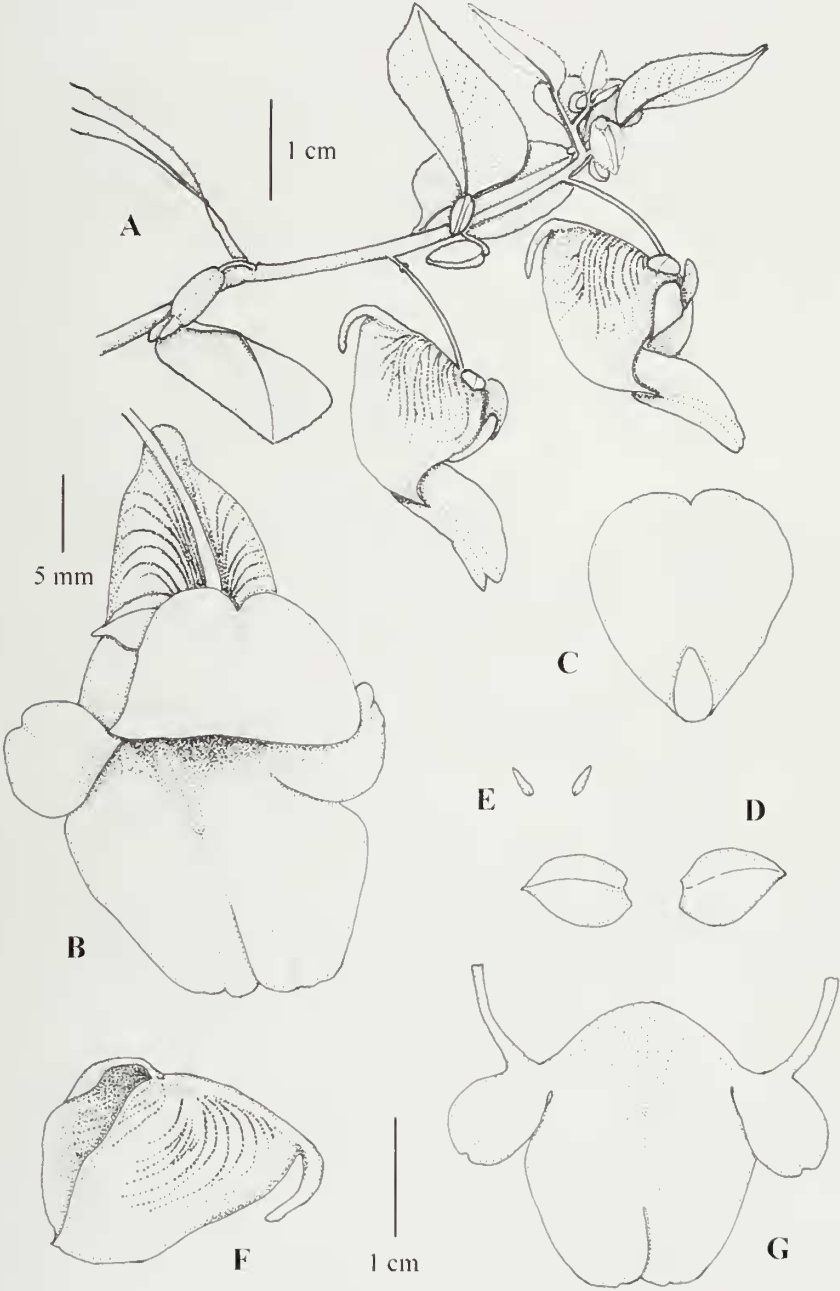


Figure 5. *Impatiens jiewhoei* Triboun & Suksathan. A. Habit; B. Flower; C. Dorsal sepal; D. Outer lateral sepals; E. Inner lateral sepals; F. Lower sepal; G. Lateral united petals. (B-C and D-H share the same scale bar). [Drawn by P. Suksathan.]

× 1.8 cm, apically bilobed, the lobe shallowly emarginated. Ovary glabrous. **Fruit** linear, 1.5-2.5 cm long; **seeds** unknown.

Flowering during the rainy season, between June and October.

Additional specimens examined: Thailand, Kanchanaburi, Kao Tok, below 50 m. alt., 13 Jul 1930, *A.F.G. Kerr* 19549 (BK, K); same province, Tha Salao, ca 100 m alt., 10 Jul 1930, *A.F.G. Kerr* 19562, (K); *ibid.*, 10 Jul 1930, *A. Marcan* 2497 (K).

Distribution and habitat: Endemic to W Thailand (Kanchanaburi). Growing in shaded mixed bamboo to dry evergreen forest in limestone area, 20-100 m alt., locally abundant, but as yet known only from the type locality.

Etymology: The specific epithet is named in honour of Mr. Tan Jiew-Hoe, the president of Singapore Gardening Society, who kindly encouraged the authors to revise the genus *Impatiens* in Thailand.

Notes: *Impatiens jiewhoei* is one of the most beautiful species, closely related to the N Thailand endemic, *I. nalampoonii* Shimizu. However, the violet-blue flower with red striped lower sepal, and basally adnate, cylindric, curved spur, leave no doubt about its separate identity.

6. *Impatiens oreophila* Triboun & Suksathan, *sp. nov.*

Impatiens chinensis L. *affinis*, a qua differt floribus albis, calcar recto vel leviter curvato ad apicem obtuso pagina interiori venatio rubro-reticulati. –

Typus: Thailand, Kanchanaburi Province, Sangkhla Buri, Khao Radar-Khao Yai, open grassy summit, 1,300-1,400 m. alt., 13 Nov 2008, *P. Triboun*, *W.J.J.O. De Wilde* and *B.E.E. Duyffjes* 4031 (holo, BK; iso, L, QBG). **Fig. 6 & Plate 2B.**

Terrestrial or lithophytic annual **herb**, completely glabrous; **stems** light green, unbranched, erect, 15-45 cm tall, with long internodes, quadrangular in transection. **Leaves** opposite, decussate, 6-9 pairs, scattered along the stem, sessile; lamina narrowly lanceolate, (6-)8.5-11.5 × 1.3-1.8 cm, coriaceous, apex acute or cuspidate, shortly cuneate at base, ± amplexicaul, margin serrate, with two green, retrorse glands at the base; lateral veins 4-6 pairs. **Flower** subterminal axillary, solitary or 2 fascicled, ca 3.5 cm long, white; pedicels slender, green, ca 4 cm long; lateral sepals 2; the outer pair linear, falcate, white to light green, ca 10 × 1 mm, apex acute; the inner pair absent; lower sepal navicular, ca 1.4 cm long, 7 mm deep, gradually tapering into a 1.7-2 cm-long, straight or slightly curved spur, white with red reticulated

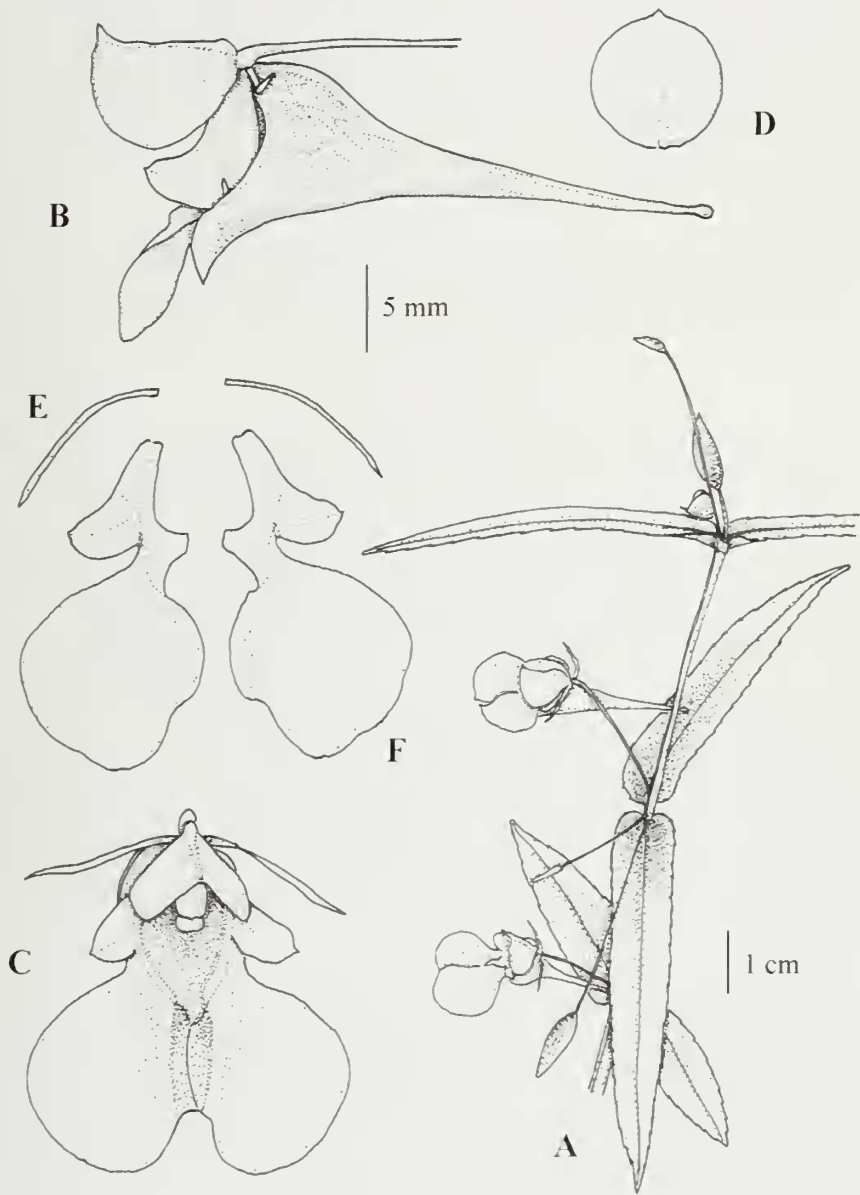


Figure 6. *Impatiens oreophila* Triboun & Suksathan. A. Habit; B. C. Flower; D. Dorsal sepal; E. Outer lateral sepals; F. Lateral united petals. (B-C and D-H share the same scale bar). [Drawn by P. Suksathan.]

veins, clearly visible on the inner surface, spur tip blunt, *ca* 0.5 mm in diameter; dorsal petal white, *ca* 8 × 7 mm, obcordate, slightly cuculate, apex mucronate, base shortly and slightly crested; lateral united petals free, white, with two violet patches at the base of the lower petals; upper petals *ca* 2 × 2.5 mm, subtriangular, apex round; lower petals obovate, *ca* 1.2 × 0.7 cm. Ovary glabrous. **Fruit** ellipsoid, 1.5-2.5 cm long; **seeds** unknown.

Flowering in late rainy season, between August-October.

Distribution and habitat: Endemic to W Thailand (Kanchanaburi), as yet known only from the type locality. Growing on exposed granite rock crevices as well as among grasses in open grassland near the summit, from 1,300-1,400 m alt.

Etymology: The specific epithet *oreophila* means mountain-loving, which refers to its habitat near the summit of the high mountain.

Notes: *Impatiens oreophila* is rather closely related to *I. chinensis* L. in having an erect, simple stem, and opposite sessile leaves. However, it is easily distinguished by its white flower, and its straight or slightly curved, blunt-tipped spur, with red reticulated veins on the inner surface.

7. *Impatiens ruthiae* Suksathan & Triboun, *sp. nov.*

Impatiens nalampoonii Shimizu *affinis*, a qua differt flori rubro-purpureo distorto, sepalis lateralibus viridibus, sepalo inferiori luteo-aurantiaco, anguste bucciniformi. – **Typus**: Thailand, Loei Province, Nong Hin district, limestone mountain, 715 m alt., 6 Jul 2008, P. Suksathan, M. Wongnak, H. Boonnuang and K. Keeratikiat 4553 (holo, QBG; iso, AAU, BK, BKF, SING). **Fig. 7 & Plate 2C.**

Lithophytic annual **herb**, completely glabrous; **stems** decumbent to erect, dark purplish brown, rather thin, to 50 cm long, laxly branched, slightly zigzag in upper part. **Leaves** alternate, petiole up to 4 cm long, with two distinctly, short-stalked, filiform glands at the middle or at the apex; lamina up to 10.5 × 5 cm, ovate, apex acuminate, base cuneate to rounded, sometimes oblique; lateral veins 5-7 pairs; margin crenate-dentate. **Flower** axillary, solitary or 2-3-fascicled, pendulous under the leaves, distorted, *ca* 4 cm long, purplish red, with orange-yellow lower sepal; pedicels *ca* 1.3 cm long, minutely bracteate at base; lateral sepals 4, the outer pair whitish green, *ca* 8 mm long, broadly ovate to suborbicular, mucronate, the inner pair strongly reduced into subelliptic, 0.5 mm-long scales; lower sepal *ca* 1.5 cm long, 2.2 cm deep, narrowly bucciniform, orange-yellow, with reticulate red veins, clearly

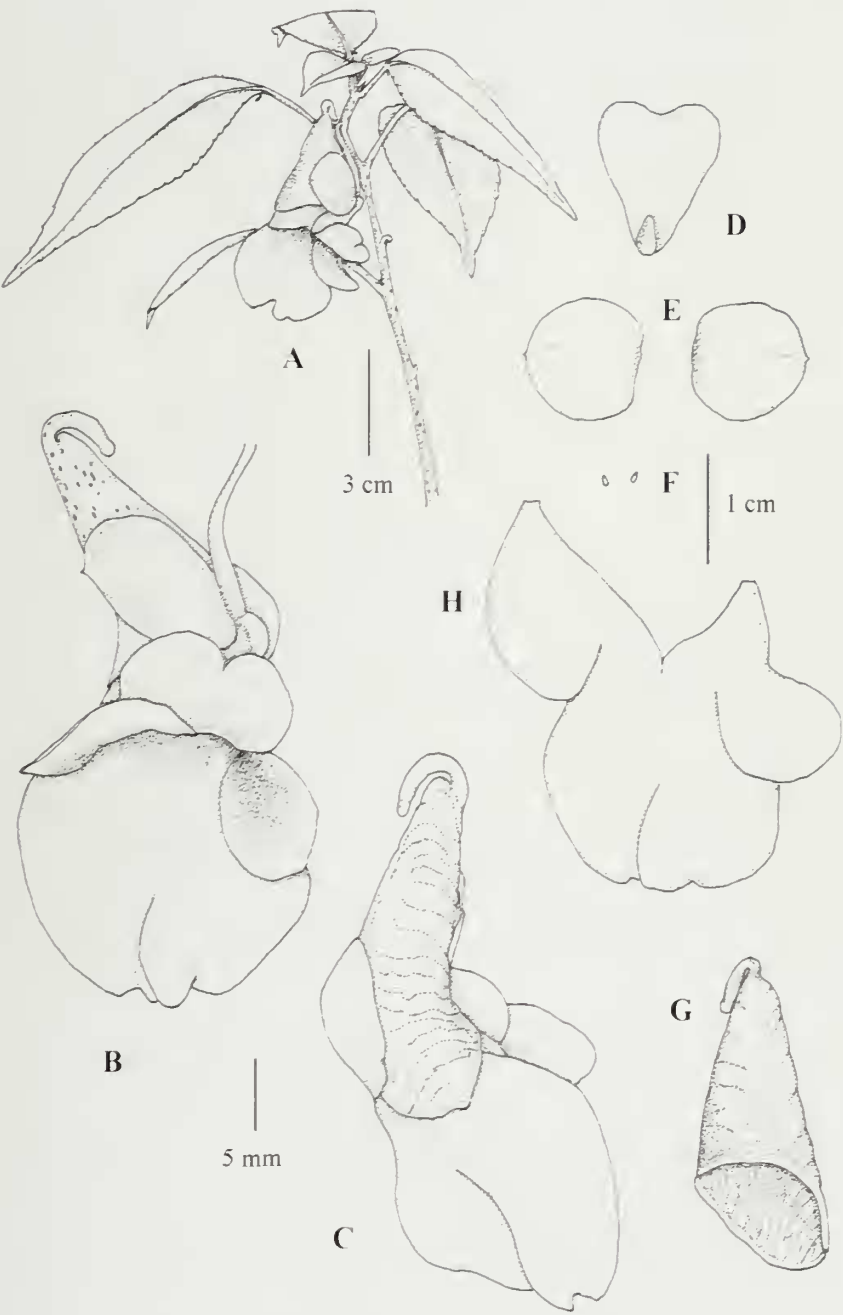


Figure 7. *Impatiens ruthiae* Suksathan & Triboun. A. Habit; B. C. Flower; D. Dorsal sepal; E. Outer lateral sepals; F. Inner lateral sepals; G. Lower sepal; H. Lateral united petals. (B-C: D-H share the same scale bar). [Drawn by P. Suksathan].

visible on the inner surface, abruptly constricted into a narrow, cylindric, *ca* 5 mm long incurved spur; dorsal petal pink, *ca* 1.4×1.1 cm, obovate, slightly cuculate, strongly reflexed in the upper half, apex emarginate, forming a subapical mucro, base with a short, green, subtriangular crest, *ca* 1.5 mm high; lateral united petals connate, purplish red, marked with a broad yellow patch at the base of the lower petals, unequally distorted; upper petals $1.1-1.2 \times 1.3-1.4$ cm, obliquely ovate, apex rounded; lower petals $1.7-2 \times 1-1.1$ mm, oblong, apically emarginate. Ovary glabrous. **Fruit** *ca* 15×4 mm, clavate, constricted in the upper part; **seeds** *ca* 1.5 mm long ellipsoid, seed coat pustulate.

Flowering during rainy season, July-September.

Distribution and habitat: Endemic to NE Thailand (Loei). As yet known only from the type locality. Growing on limestone in moist, shaded limestone foothill at *ca* 715 m alt., rather rare.

Etymology: The plant is named in honour of Dr. Ruth Kiew in Malaysia, a botanist and a limestone plant expert who has supported this project.

Notes: *Impatiens ruthiae* is one of the most peculiar species with its burgundy red flowers, a colour rarely found in other Asian species.

8. *Impatiens sirindhorniae* Triboun & Suksathan, *sp. nov.*

Impatiens walleriana Hook.f. *affinis*, a qua differt caulibus decumbentibus usque ad pendentibus, foliis griseo-viridis ovatis coriaceis, floribus calcaribus profunde navicularibus. – **Typus**: Thailand, Krabi Province, Plaai Phraya district, vertical limestone cliff, 20-150 m alt., 25 Jun 2007, P. Triboun, P. Blenchitra and P. Yothakaew 3801 (holo, BK, iso, AAU, QBG, SING). **Fig. 8, Plates 2D, 3C & D.**

Lithophytic perennial **herb**, forming basal tillers, up to 15 stems, wholly glabrous; **stems** succulent, decumbent to pendulous, greyish to brownish green, glaucous, to 40 cm long, rarely branched. **Leaves** spirally arranged, somewhat crowded on the upper part of stem, petiole 6-7.5 cm long, with two distinct, short-stalked glands at the apex; *lamina* $3.2-4 \times 2.8-3.5$ cm, ovate, thickly coriaceous, greyish green, apex acute, base truncate to subcordate, margin roughly serrate; lateral veins 3-6 pairs. **Flowers** axillary, solitary, rarely 2-fascicled, large, rather flat, 4.5-4.8 cm wide, light purple; pedicels slender, suberect, 3-6.5 cm long, \pm minutely bracteate at base; *lateral sepals* 4, the outer pair whitish green, $6-7 \times 3-5$ mm long, obliquely ovate, acute, the inner pair strongly reduced into whitish green, cordate to rotund, *ca* 2.5 mm scales; lower sepal 1.6×1.6 mm, deep navicular, pale to whitish

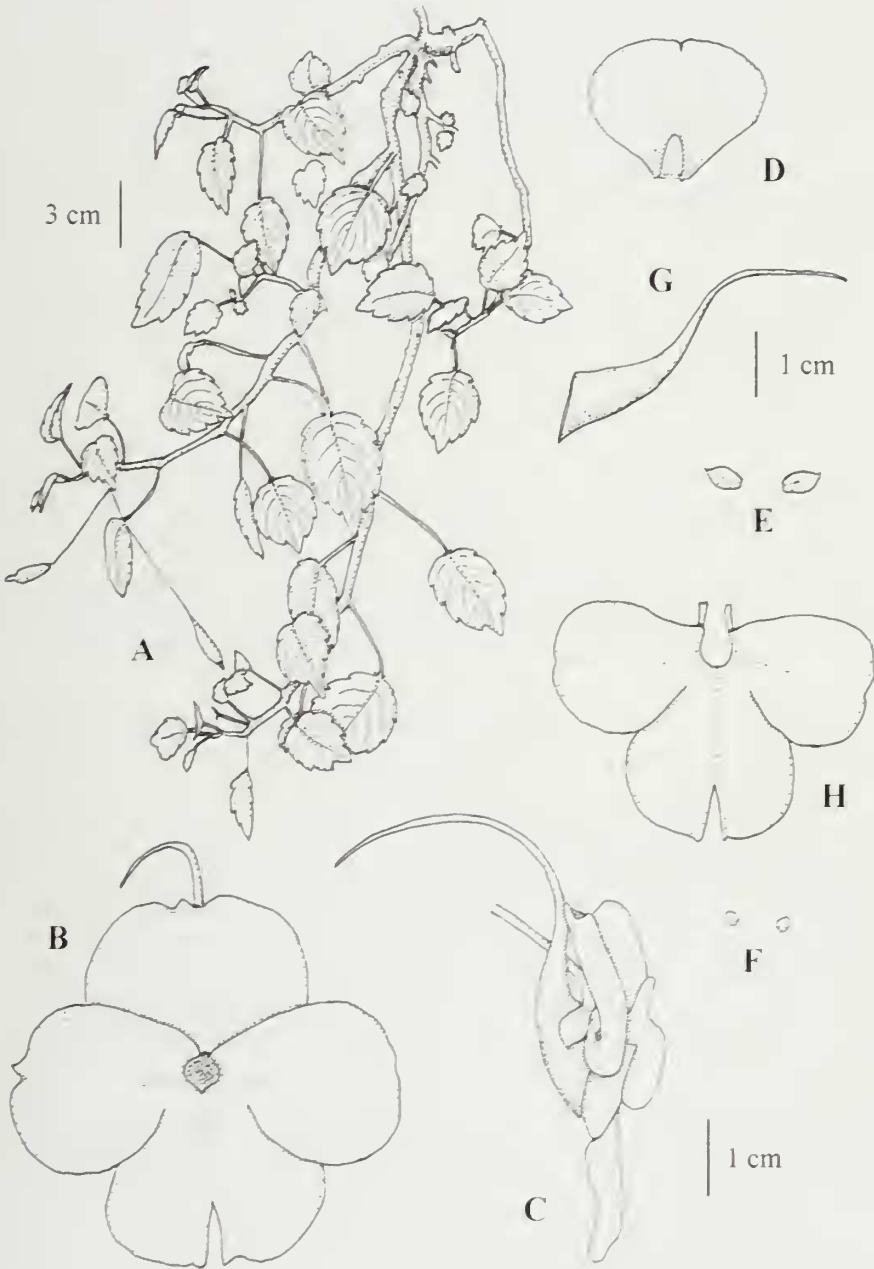


Figure 8. *Impatiens sirindhorniae* Triboun & Suksathan. A. Habit: B. C. Flower: D. Dorsal sepal: E. Outer lateral sepals: F. Inner lateral sepals: G. Lower sepal: H. Lateral united petals. (B-C and D-H share the same scale bar). [Drawn by P. Suksathan.]

green, gradually constricted into a narrow, cylindric, curved, *ca* 6 cm long spur; dorsal petal, *ca* 2 × 2.5 cm, depressed obovate, strongly reflexed just above the base, apex cuspidate, base with a short, white, subtriangular crest, *ca* 2 mm high; lateral united petals connate, forming 3 subequal lobes, which are also subequal to the dorsal one; upper petals *ca* 2.5 × 2 cm, obovate, apex cuspidate; lower petals connate for about two-third of the length, depressed obovate in outline, *ca* 2.0 × 2.5 cm, apically bilobed. Ovary glabrous. **Fruit** ellipsoid; **seeds** unknown.

Additional specimen examined: Thailand, Surat Thani Province, Kao Ken, 50 m alt., 27 Mar 1927, *A.F.G. Kerr 12446* (BK, K).

Flowering in rainy season, between June-October.

Distribution and habitat: Endemic to peninsular Thailand (Krabi and Surat Thani). Growing on open or shaded vertical limestone cliffs, 20-150 m alt.

Etymology: The specific epithet is given in honour of Her Royal Highness Princess Sirindhorn for her dedication and encouragement to the environmental sciences and biodiversity conservation in Thailand.

Notes: *Impatiens sirindhorniae* is one of the most beautiful perennial species, easily recognized by its pendulous habit, succulent thick leaves and large light purple flower.

9. *Impatiens spectabilis* Triboun & Suksathan, *sp. nov.*

Impatiens walleriana Hook.f. *affinis*, a qua differt herba annua, androeceo et gynoeceo occultis per bases petalorum, cum apertura angusta, sepalis latioribus. – **Typus:** Thailand, Kanchanaburi Province, Thong Phaphum, Wat Tha Khanun, on limestone, *ca* 135 m alt., 10 Oct 2008, *P. Triboun*, *H. Boonnuang* and *K. Keeratikiat* 3889, (holo, BK; iso, BKF, K, QBG, SING).

Fig. 9 & Plate 3A.

Moderately branched, terrestrial or lithophytic, annual **herb**; **stems** decumbent to erect, fragile, up to 40 cm long, often rooting at the lower nodes. **Leaves** alternate, scattered along the stems, petiole 1-3.5 cm long, dull red, finely pubescent to glabrescent; lamina 5-11 × 2-5.5 cm, ovate to lanceolate, apex acute to acuminate, base cuneate to subcordate, sometimes oblique, margin serrate, with two distinct, short-stalked, clavate glands near the base; lateral veins 6-8 pairs. **Flowers** axillary, solitary, rarely 2 fascicled, large, flat, *ca* 4 cm wide, bright pink; *pedicels* slender, suberect, *ca* 3 cm long, minutely bracteate at base; lateral sepals 2(-4), the outer pair dull red, 6-10

$\times 6$ mm long, obliquely broadly ovate, mucronate, the inner pair absent, or strongly reduced into small scales, less than 1 mm long; lower sepal shallowly navicular, 14 mm long, 6 mm deep, white to reddish green, abruptly constricted into a narrow, cylindric, curved, 4.5-4.8 cm long spur; dorsal petal $ca\ 1.3 \times 1.8$ cm, obovate, minutely apiculate, strongly reflexed just above the base, base with a short, red, subtriangular crest, $ca\ 2$ mm high; lateral united petals partly connate, forming 4 subequal lobes, which are also subequal to the dorsal one; upper petals $ca\ 1.7 \times 1.3$ cm, obovate, minutely apiculate; lower petals connate for about half of the length, slightly obliquely obovate, $ca\ 2.3 \times 1.5$ cm, minutely apiculate; the base of all petals positioned closed to each other forming a small aperture hiding the androecium and gynoecium underneath. Ovary glabrous. **Fruit** clavate; **seeds** many, $1.5-2.1 \times 1-1.2$ mm.

Additional specimens examined: Thailand, Kanchanaburi Province, Thong Pha Phum distric, Kwai river valley, $ca\ 100$ m alt., 21 Oct 1984, *J. Dransfield* 6218 (K); same district, near Neeckey, near Wangka, 150 m alt., 13 Jun 1946, *G. den Hoed* 945 (K); same district, I-Thong, along gas pipe-lines, 21 Nov 1997, *K. Chayamarit* 1002 (BKF); same district, Kao Leam dam, 29 Nov 1982, *K. Hiroshike*, *T. Hiroshi*, *C. Niyomdham*, & *T. Wongprasert* T-30452 (BKF); same locality, 10 Jul 1981, *T. Santisuk s.n.* (BKF).

Flowering in rainy season, between July-October.

Distribution and habitat: W Thailand (Kanchanaburi). A very common species forming large colonies on mountain slopes and limestone outcrops in lowland dry evergreen and mixed deciduous forests along roadside from Thong Phaphum to Sangkla Buri district. Also observed in Myanmar.

Etymology: The specific epithet refers to its spectacular large pink flower that are easily spotted from a distance.

Notes: A very common but peculiar species, *Impatiens spectabilis* has a very characteristic flower, flat, with a large dorsal petal, and lateral united petals almost equal in size and shape, and especially the androecium and gynoecium that are hidden behind a very narrow aperture formed by petal bases. It would be very interesting to study its floral morphology and pollination.

10. *Impatiens tigrina* Suksathan & Triboun, *sp. nov.*

Impatiens charanii Shimizu affinis, a qua differt flore luteo, sepalis lateralibus libris, calcari simplici. – **Typus:** Thailand, Udon Thani Province, Ban Paeu district, shaded sandstone table, $ca\ 300$ m alt., 8 Jul 2008, *P. Suksathan*, *M. Wongnak*, *H. Boonnuang* and *K. Keeratikiat* 4567 (holo, QBG; iso, BK,

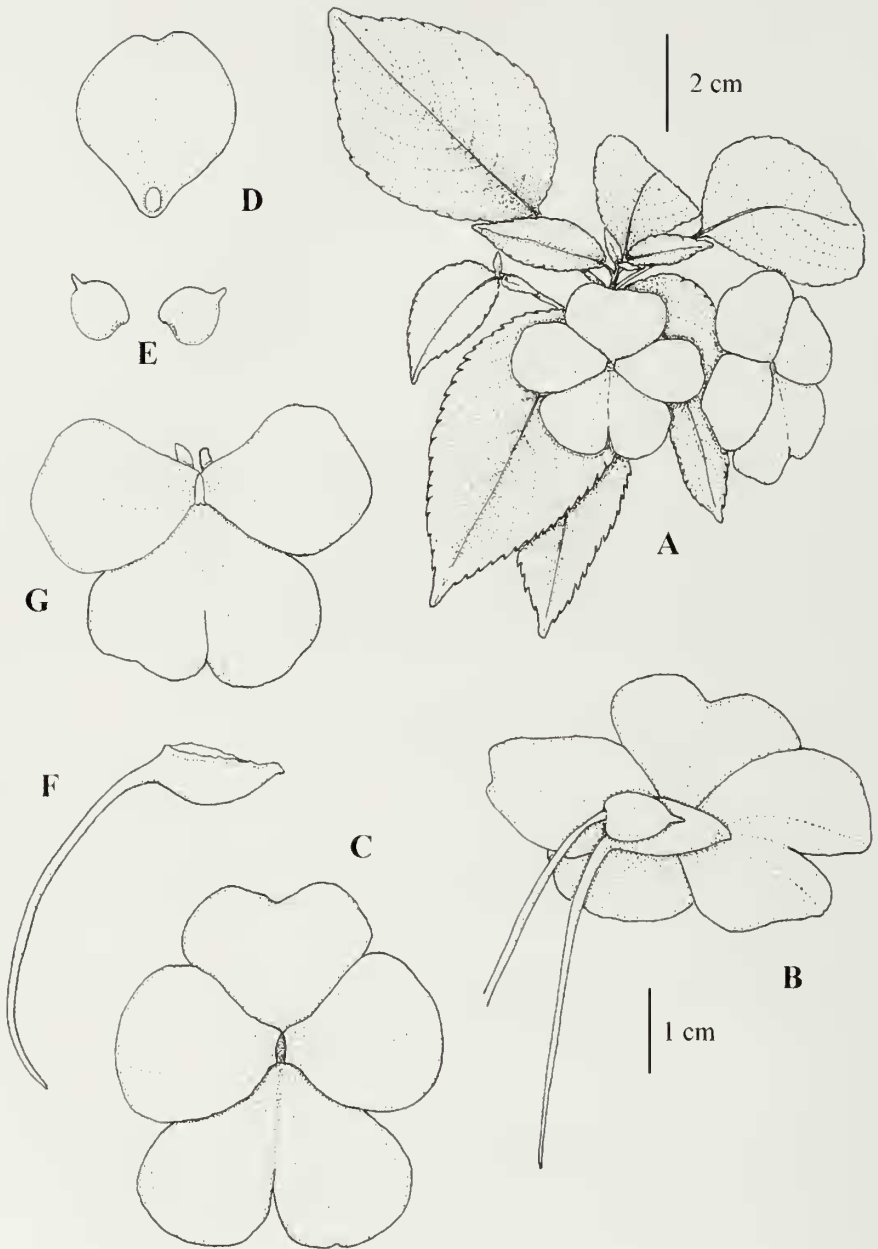


Figure 9. *Impatiens spectabilis* Triboun & Suksathan. A. Habit; B, C. Flower; D. Dorsal sepal; E. Outer lateral sepals; F. Lower sepal; G. Lateral united petals. (B-C and D-H share the same scale bar). [Drawn by P. Suksathan.]

SING). **Fig. 10 & Plate 3B.**

Lithophytic annual **herb**, with a green, erect cylindrical main stem, to 30 cm long, *ca* 1.3 cm in diameter, richly branched at the top, completely glabrous; branches of **stem** up to 30 cm long, purplish red or purplish brown, rather thin, up to 30 cm long, slightly zigzag in upper part. Leaves ovate to broadly lanceolate, apex acuminate, base cuneate to round, sometimes oblique, with two distinct, short-stalked, fusiform glands at the base; lateral veins 12-15 pairs; margin crenate-dentate; the basal ones larger, spirally arranged, petiole 8-10 cm long and lamina up to 25×10 cm in basal leaves; the upper leaves congested on top of the main stem, smaller, alternately arranged along branches, petiole 5-10 mm long and lamina $7-16 \times 2.5-6$ cm. **Flowers** axillary, solitary or 2-3-fascicled, pendulous under the leaves, yellow, *ca* 4 cm long, with orange-red transverse stripes on lower sepal; pedicels *ca* 1 cm long, minutely bracteate at base; lateral sepals 4, the outer pair pale green, *ca* 10×7 mm long, obliquely broadly ovate, mucronate, the inner pair strongly reduced into small sublanceolate, light green scales, *ca* 2 mm long; lower sepal *ca* 1.6 cm long, 2 cm deep, broadly bucciniform, with orange-red transverse stripes, clearly visible on the inner surface, abruptly constricted into a narrow, 8 mm-long incurved claviform spur, swollen toward the tip; dorsal petal yellow, *ca* 1.6×1.2 cm, cuculate, obovate, retuse, with a thick, green, blunt crest in the lower half; lateral united petals connate, entirely yellow; upper petals *ca* 1.5×1.6 cm, depressed orbicular; lower petals connate, suborbicular in outline, *ca* 1.8×2 cm, with a prominent basally bilobed keel, apex emarginate. Ovary glabrous, 4-carpellate. **Fruit** subfusiform, *ca* 2 cm long; **seeds** many, *ca* 3 mm long, obovoid.

Flowering in rainy season, between July-September.

Distribution and habitat: Endemic to NE Thailand (Udon Thani), as yet known only from the type locality. Growing on sandstone in shaded sandstone tables in dry evergreen forest *ca* 300 m alt.

Etymology: The specific epithet, *tigrina*, means like a tiger, referring to its yellow flower with red striped lower sepal.

Notes: *Impatiens tigrina* was first introduced to the first author by Mr. Methee Wongnak, a geographer from Queen Sirikit Botanic Garden. Its growth habit strongly resembles *I. charanii* Shimizu, but the yellow flower with free outer lateral sepals and simple spur leave no doubt of its identity.

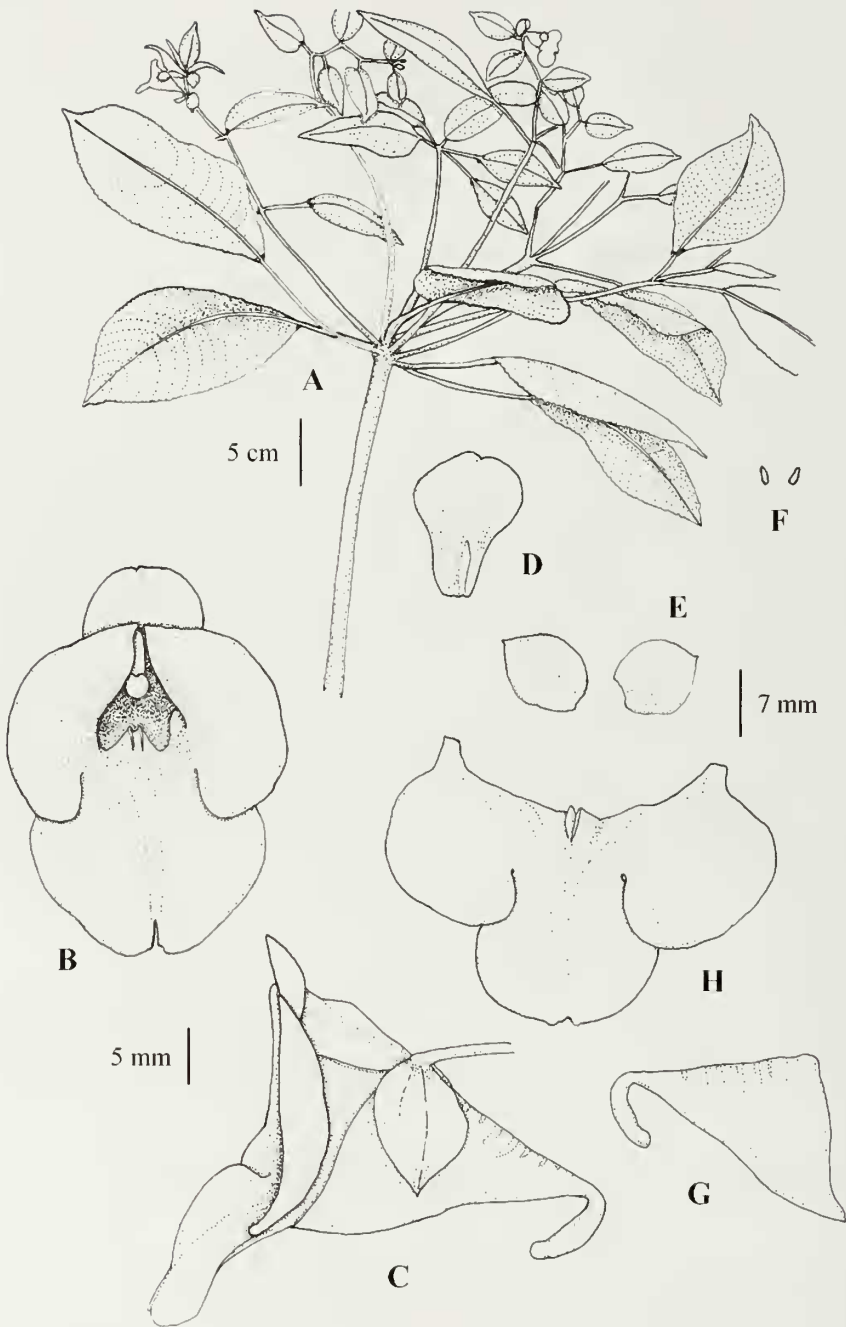


Figure 10. *Impatiens tigrina* Suksathan & Triboun. A. Habit; B, C. Flower; D. Dorsal sepal; E. Outer lateral sepals; F. Inner lateral sepals; G. Lower sepal; H. Lateral united petals. (B-C and D-H share the same scale bar). [Drawn by P. Suksathan.]

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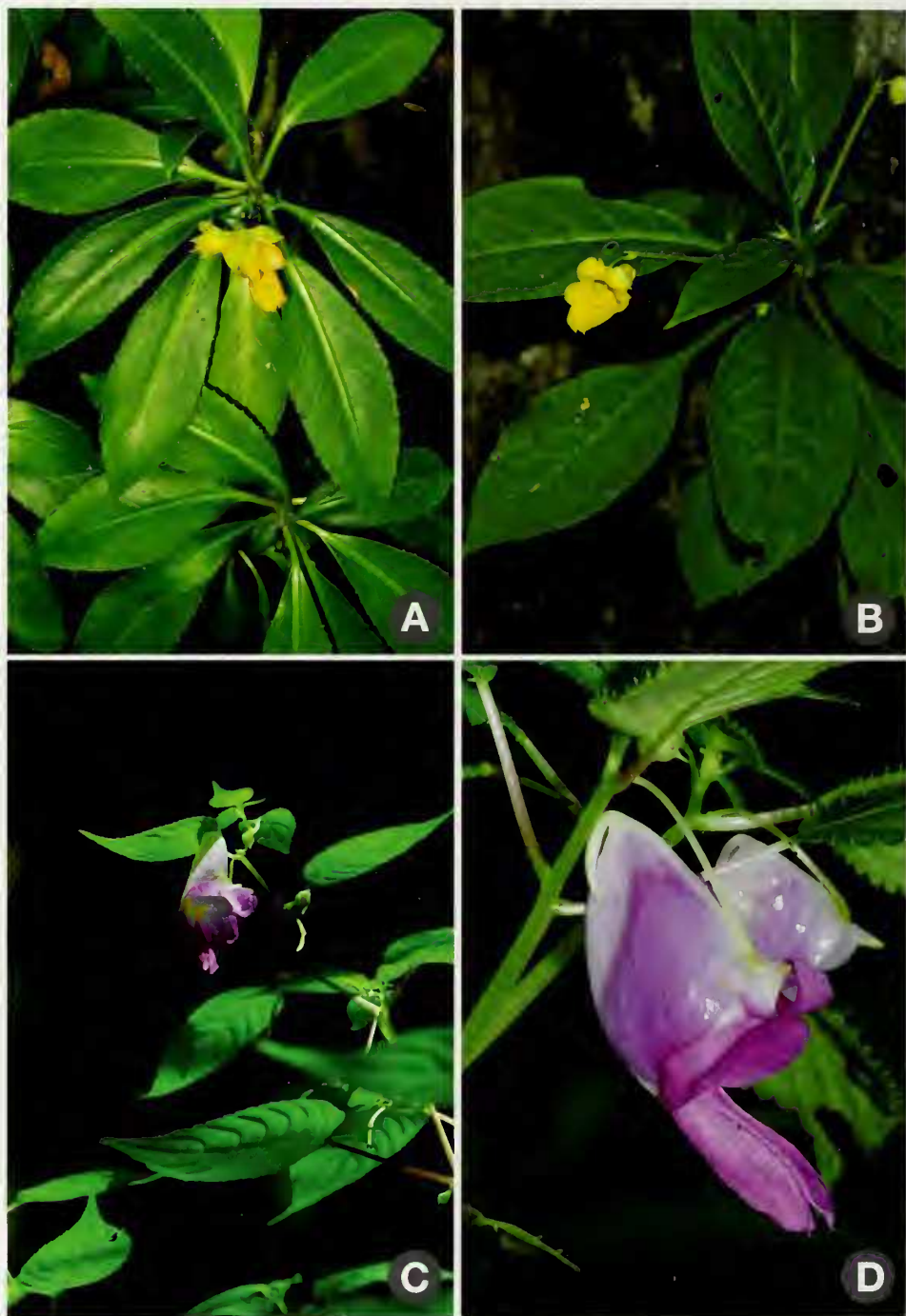


Plate 1. A. *Impatiens adenioides* Suksathan & Keerat.; B. *I. charisma* Suksathan & Keerat.; C. *I. daraneenae* Suksathan & Triboun; D. *I. doitungensis* Triboun & Sonsupab. (Photos: H. Boonnuang).

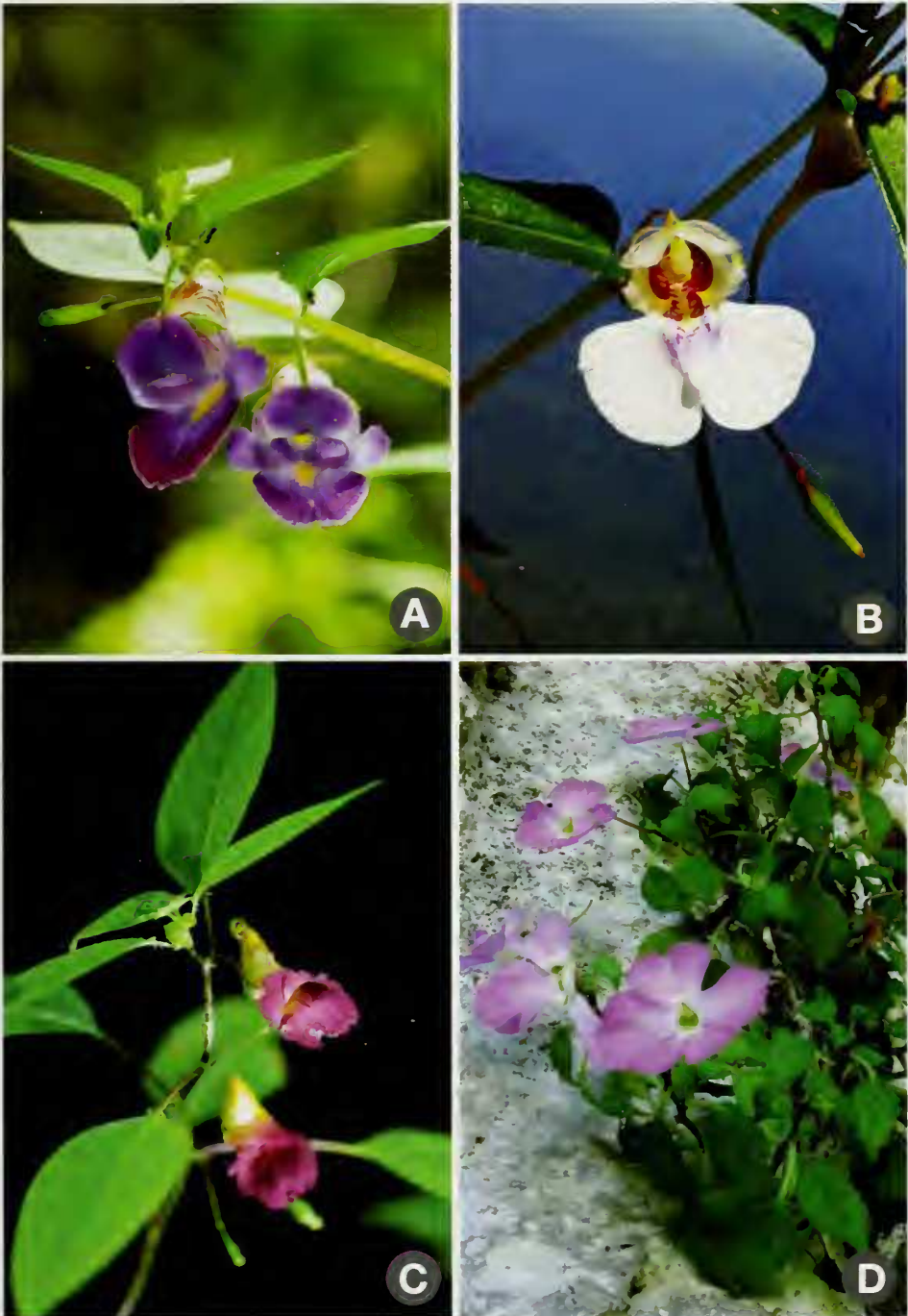


Plate 2. A. *Impatiens jiewhoei* Triboun & Suksathan; B. *I. oreophila* Triboun & Suksathan; C. *I. ruthiae* Suksathan & Triboun; D. *I. sirindhorniae* Triboun & Suksathan. (Photos: H. Boonnuang).

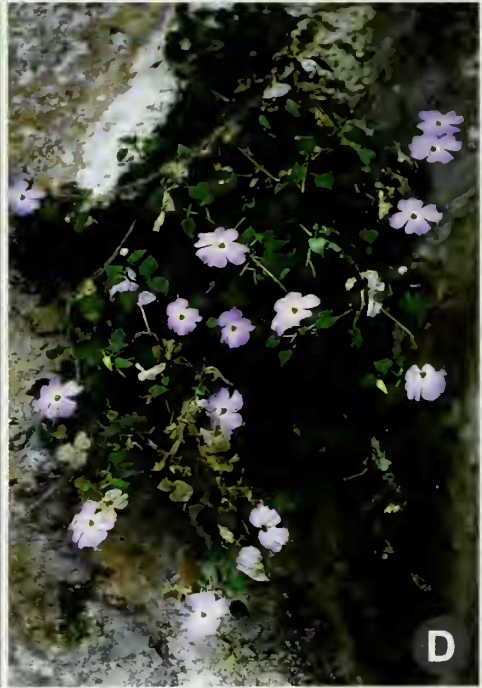


Plate 3. A. *Impatiens spectabilis* Triboun & Suksathan; B. *I. tigrina* Suksathan & Triboun; C-D. *Impatiens sirindhoriae* Triboun & Suksathan (Photos: H. Boonnuang).